

ABSTRACT

An MRAM structure is disclosed where the distance from a bit line or word line to an underlying free layer in an MTJ is small and well controlled. As a result, the bit line or word line switching current is reduced and tightly distributed for better device performance. A key feature in the method of forming the MRAM cell structure is a two step planarization of an insulation layer deposited on the MTJ array. A CMP step flattens the insulation layer at a distance about 60 to 200 Angstroms above the cap layer in the MTJ. Then an etch back step thins the insulation layer to a level about 50 to 190 Angstroms below the top of the cap layer. Less than 5 Angstroms of the cap layer is removed. The distance variation from the free layer to an overlying bit line or word line is within +/- 5 Angstroms.